LESSON 4: SEDIMENT DEPOSITION AND RIVER STRUCTURES

ESSENTIAL QUESTION:

What combination of factors both natural and manmade is necessary for healthy river restoration and how does this enhance the sustainability of natural and human communities?

GUIDING QUESTION:

As rivers age and slow they deposit sediment and form sediment structures, how are sediments and sediment structures important to the river ecosystem?

OVERVIEW:

The focus of this lesson is the deposition and erosional effects of slow-moving water in low gradient areas. These "mature rivers" with decreasing gradient result in the settling and deposition of sediments and the formation sediment structures. The river's fast-flowing zone, the thalweg, causes erosion of the river banks forming cliffs called cut-banks. On slower inside turns, sediment is deposited as point-bars. Where the gradient is particularly level, the river will branch into many separate channels that weave in and out, leaving gravel bar islands. Where two meanders meet, the river will straighten, leaving oxbow lakes in the former meander bends.

TIME:

One class period

MATERIALS:

- **Lesson 4- Sediment Deposition and River Structures.pptx**
- **Lesson 4a- Sediment Deposition and River Structures.pdf**
- **StreamTable.pptx**
- **StreamTable.pdf**
- **Mass Wasting and Flash Floods.pptx**
- **Mass Wasting and Flash Floods.pdf**
- Stream Table
- Sand
- Reflection Journal Pages (printable handout)
- Vocabulary Notes (printable handout)

PROCEDURE:

1. Review Essential Question and introduce Guiding Question.
2. Hand out first Reflection Journal page and have students take a minute to consider and respond to the questions then discuss responses and questions generated.
3. Handout and go over the Vocabulary Notes. Students will define the vocabulary words as they watch the PowerPoint Lesson.
4. Present PowerPoint Lesson
5. Run Demonstration on Stream Table of a low-gradient mature river
6. Run Demonstration of Mass Wasting and Flash Floods
7. Show features such as the thalweg, meanders, cut-banks, point-bars, and braiding.

ASSESSMENTS:

WASHINGTON STATE STANDARDS:

SCIENCE

1. **EALR4: 6-8 ES3A** Our understanding of Earth history is based on the assumption that processes we see today are similar to those that occurred in the past.
    a. Describe Earth processes that we can observe and measure today (e.g., rate of sedimentation, movement of crustal plates, and changes in composition of the atmosphere) that provide clues to Earth's past.
2. **EALR 4: 6-8 ES2G** Landforms are created by processes that build up structures and processes that break down and carry away material through erosion and weathering.
    a. Explain how a given landform has been shaped by processes that build up structures and by processes that break down and carry away material.

READING

1. **EALR 1:** The student understands and uses different skills and strategies to read.
    a. **Component 1.2** Use vocabulary (word meaning) strategies to comprehend text.

SOCIAL STUDIES

1. **EALR 5:** The student understands and applies reasoning skills to conduct research, deliberate, form, and evaluate positions through the processes of reading, writing, and communicating.
    a. **Component 5.2:** Uses inquiry-based research.

WRITING

1. **EALR 2:** The student writes in a variety of forms for different audiences and purposes.

a. **Component 2.1:** Adapts writing for a variety of audiences.

ADDITIONAL RESOURCES AND ENRICHMENT:

http://geography.howstuffworks.com/terms-and-associations/river3.htm

http://chamisa.freeshell.org/flow.htm

http://www.bioed.org/ecos/inquiries/Inquiries/LCSediments.pdf

VOCABULARY TERMS:

- **Meander:** When the floodplain is becomes sufficiently level rivers meander. As the river strikes an area of slightly more resistant material, it is deflected. This causes the thalweg of the river to strike the banks at angles and at higher velocity, cutting into the outside turn, while depositing material on the inside turn.

- **Thalweg:** Line of fastest water velocity in a river. Thalwegs strike the cut-bank in a river meander

- **Cut-bank**: The outside curve of a river meander, where erosion is greatest due to the higher stream velocities, causing cutting on the bank and sometimes forming a small cliff

- **Point-bar:** The inside-curve of a river meander, where stream velocity is slow and deposition of sediment is greater.

- **Braided Stream:** When a fast flowing river from high gradient encounters a broad, flat valley that is overloaded in erodible sediment, it will begin to spread out into multiple channels that are interconnected. These channels constantly migrate across the flood of the valley, as they meander through the sediment.

- **Oxbow Lake:** When two meander curves meet, they circumvent the meander, and straighten the flow of the river. The abandoned channel can become disconnected from the river by sediment to form a lake. These lakes eventually fill in with sediment.

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Reflection Journal 1

What are some features you have noticed along river banks? Have you ever seen a beach along a river? Where do you think that beach came from?

What questions do you have about river banks?

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Reflection Journal 2

How do you think sediment deposits and sediment structures benefit the river ecosystem?

What questions do you have about river sediments, sediment structures and/or banks? How could you find answers to your questions?

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Sediment Deposition and River Structures

Vocabulary Notes

Meander:

Thalweg:

Cut-bank:

Point-bar:

Braided Stream:

Oxbow Lake: